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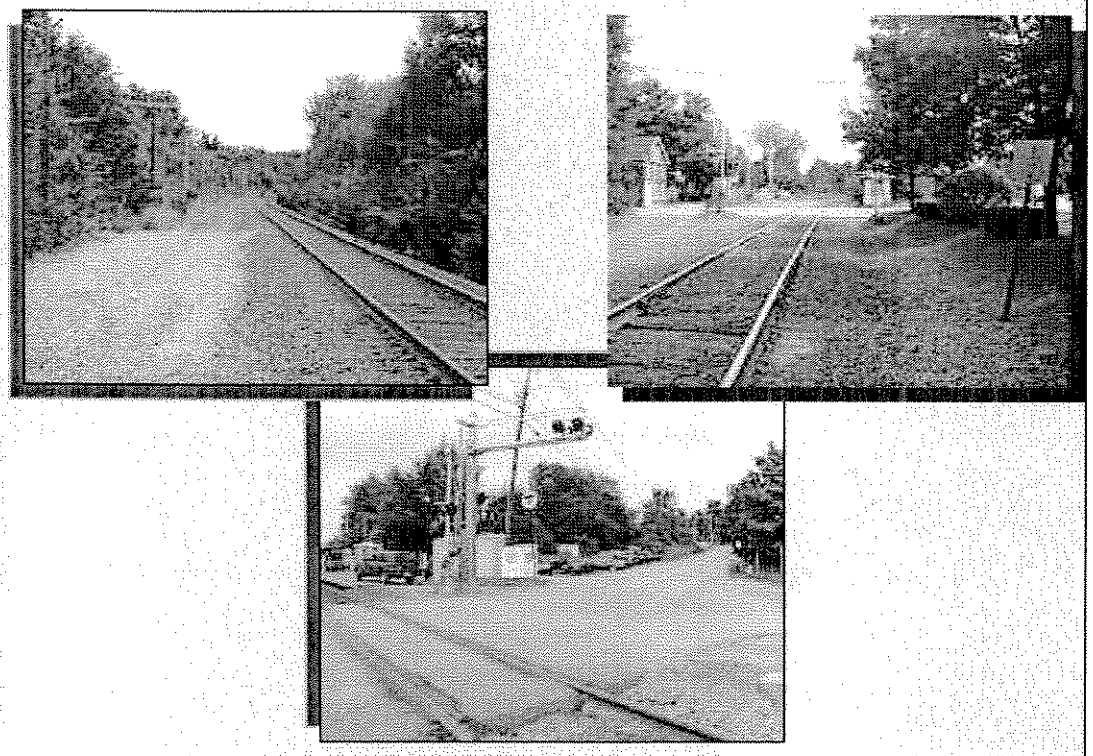
FITCHBURG COMMUTER RAIL LINE IMPROVEMENT IMPLEMENTATION PLAN



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McMAHON ASSOCIATES INC

RESPONSIVE TRANSPORTATION SOLUTIONS

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INTRODUCTION

Upon completion of the Fitchburg Commuter Rail Expansion Study, the MBTA staff presented the findings and recommendations to the Authority's senior staff, public officials and the Fitchburg Commuter Rail Improvement Steering Committee. Based on the input received and the findings made in the Study, the decision was made to develop a Fitchburg Line Improvement Implementation Plan which had as its overriding objective to reduce the trip times between Fitchburg and Porter Square to one hour from its current scheduled trip time of one hour and twenty minutes during the morning peak.

The first step in developing this implementation plan was to determine what physical improvements would be needed along the line to reduce travel times and improve speeds. Once these improvement actions could be identified, an implementation sequence or improvement schedule was needed to establish a list of improvements in order of priority. Although it is possible to implement certain projects outside of the proposed sequence, doing so will result in a less efficient implementation program. In addition, the proposed implementation sequence will result in increased service reliability as implementation proceeds. A piecemeal approach would not offer the same improvements in service reliability and may introduce implementation inefficiencies.

Secondly, it was necessary to develop preliminary cost estimates to identify the funding requirements of the implementation plan. These preliminary estimates of the cost were developed for each proposed action and summarized to derive a total project cost.

To determine the benefits of implementing these improvements, an estimate of new daily boardings was developed. The factors affecting these ridership changes were limited to the increase in speed and the commensurate reduction in travel times. No effects for increased capacity on trains, additional service, or in parking availability were made so that the estimated changes in ridership could be fully isolated and attributed to the effects of a one-hour trip-time.

Finally, a recommended implementation plan was developed and mapped for the Fitchburg Line. The map provides a geographic summary of the implementation actions planned along the line. A more detailed and technical listing of the improvements called for is included in the Appendix, which describes each improvement action by mile-post.

CURRENT TRAVEL TIME PROFILE

The current Fitchburg/South Acton Line commuter rail schedule went into effect on April 25, 2005. This schedule currently details three inbound trains scheduled to make all stations stops between Fitchburg and Boston during the weekday morning commuter peak period. One of these trains has a scheduled trip time of one hour and thirty minutes from Fitchburg to Boston, or one hour and nineteen minutes between Fitchburg and Porter Square. The other two trains have scheduled trip times of one hour and thirty two minutes from Fitchburg to Boston, or one hour and twenty one minutes between Fitchburg and Porter Square. During the weekday evening commuter peak period only one outbound train is scheduled to make all station stops between Boston and Fitchburg, with a scheduled trip time of one hour and thirty four minutes, or one hour and twenty four minutes from Porter Square to Fitchburg.

Observations of typical trip characteristics along the Fitchburg Line were made by riding a scheduled commuter train and recording the actual travel time for individual track sections. Specifically, we recorded the dwell time at each of the 15 station stops between Fitchburg and Boston and the period of deceleration and acceleration before and after each station stop. Excluding the Kendal Green and Waverly station stops, which had no boardings or alightings on the recorded trip, the average dwell time at the other 13 station stops between Fitchburg and Boston was 42 seconds. The total time required to slow for a station, stop at the station, then accelerate to the track speed limit, however, is substantially greater. The average recorded time to decelerate, stop, and accelerate for each station stop was three minutes and six seconds.

The recorded observations for trip segment times along the Fitchburg Line verify initial study assumptions that consolidating stations to reduce the frequency of train deceleration, dwell, and acceleration periods will significantly improve scheduled travel times. Consolidating stations along the line to reduce the number of deceleration, dwell, and acceleration periods from the existing 15 locations to 11 locations will result in a travel time savings of more than 12 minutes per scheduled trip.

The second greatest limitation to increased operating speeds is the existing track speed ratings. The frequency of grade crossings, the actual track layout, and the antiquated signal system are all contributing factors to the existing limitations on train speeds along the line. The existing track ratings prohibit speeds in excess of 60 miles per hour, and of the 50 track miles between Boston and Fitchburg approximately 33 miles are rated for speeds of 60 miles per hour. If a speed of 80 miles per hour could be obtained for the track currently rated at 60 miles per hour, a time savings of eight minutes and 25 seconds could be achieved. Obtaining speeds of 80 miles per hour along the line would require substantial upgrades to all track sections.

As further detailed in the next section, implementation of the Fitchburg Line Improvement Plan will facilitate the reduction of trip times between Fitchburg and Porter Square to the study objective of one hour.

FITCHBURG LINE IMPROVEMENT PRIORITIES

To develop a set of actions that would improve the travel times to the one-hour level, McM staff and MBTA Planning and Commuter Rail staff met on several occasions with the staff of Railroad Operations and the Mass Bay Commuter Railroad staff, which operates MBTA's commuter rail service, to discuss potential improvements.

The first issue for discussion was the design speed of the track. As previously mentioned, top speeds permitted on the line are currently set at 60 miles per hour. Upgrading this to a design speed of 80 miles per hour, wherever possible, was thought to be a reasonable objective and provided the context from which other improvement actions were considered.

A wide range of actions were considered to meet the one-hour travel-time objective. All actions considered were analyzed based on the primary assumption that the ongoing process to upgrade to continuously welded track will be completed prior to the implementation of this improvement plan. In addition to improving the tracks, including alignments and drainage, improvements to signals, crossovers/interlockings, grade crossings, station platforms, station consolidation, double-tracking and grade-separation were all considered in the development of a comprehensive improvement plan. Railroad Operations and MBCR personnel have an in-depth understanding of conditions on the Fitchburg Main Line and the status of ongoing improvement projects.

To facilitate the preparation of the implementation plan, staff used a detailed track map to develop improvements by location from North Station to Fitchburg. A detailed list of actions by location is provided within the Appendix of this implementation plan.

Although the project is summarized as individual tasks in logical order of implementation, time savings cannot be assigned to the implementation of any of these tasks individually, rather the travel time savings depend on reaching full implementation of the entire plan. Once fully implemented, it will be possible to achieve the design speed of 80 mph and operate through the improved grade crossings and new grade separations at the higher design speed. A summary of the proposed improvement actions, listed in order of priority, are provided below in table format in the Cost and Ridership section.

Listed as the first step in the list of improvement actions is the completion of the installation of continuously welded track. Following this is the replacement of the signal system from South Acton to Boston, the first step to upgrading the entire line with an in-cab signal system. In conjunction with upgrading the signal system, the rolling stock operating on this section would be retrofitted with in-cab signal systems.

The next major action is a series of improvements to grade separate the tracks through Waltham to eliminate the conflicts with the heavy traffic at the existing grade crossings. This upgrade is referred to as the Waltham Grade Separation Project. Included in this upgrade is the reinstallation of double tracks in Waltham.

The next series of actions address improvements from South Acton through Ayer. The first is the continued replacement of the signal system along this section. Reinstitution of double tracks from South Acton to Ayer would be the next major improvement. To separate commuter rail traffic from the heavy freight movements in Ayer, a commuter rail flyover is proposed on the section of track near the downtown, called the Willows.

Replacement of the Route 62 underground bridge in Concord is the next priority improvement proposed along the line.

Next, to complete the signal system upgrades, replacement of the signal system between Fitchburg and Ayer would be done. Following signal system upgrades, system-wide improvements to track and right-of–way would be done to increase speeds wherever possible. Completing the Fitchburg Main Line Master Drainage Program would round-out the system-wide improvements.

The next rounds of improvements focus on station and grade separation improvements to reduce delays. Two station consolidations, one for the Ayer and Shirley stations and one for the Kendall Green, Hastings and Silver Hill stations, convert five stations into two, thus reducing delays while serving the same populations due to the close proximity of the current stops. Grade separation of the Great Road crossing in Lincoln and Parker Street crossing in Acton should be done next.

A series of grade-crossing upgrades and potential grade-separations are recommended at South Street in Waltham, Church Street, Viles Street, and Conant Road in Weston, and Main Street in Shirley.

Consolidation of the Belmont and Waverly stations would improve travel time, while still serving the same populations.

The final round of travel time improvements calls for installing high-level platforms at all of the stations along the line that currently have low-level platforms. Although high-level platforms have the desireable benefit of reducing station dwell times, their implementation throughout the line may be impractical due to the width required to accommodate freight trains. Therefore, implementation should focus on constructing high-level platforms from South Acton to Boston.

Two associated recommendations, which do not directly lead to increased speeds/reduced travel times, are the need for additional train sets and the construction of a regional parking facility near I-495 in Littleton. This new equipment and facility would help meet the increased ridership demand. In addition, once the track and signal upgrades are complete the additional train sets could be used to supply additional service.

COST AND RIDERSHIP

Estimates of the impact of a 20-minute reduction in travel times between Fitchburg and Porter Square in Cambridge were calculated in terms of both cost and ridership. CTPS prepared a ridership analysis that indicates daily boardings would increase by 3,200 – an almost 40% increase above existing ridership levels upon implementation of the improvement plan.

The table below summarizes the cost associated with the design and implementation of the proposed improvements summarized in the Improvement Priorities section.

Proposed Improvements and Costs
Fitchburg Commuter Rail Line

Installation of continuously welded track	$5,000,000
Replace signal system from South Acton to Boston	$39,600,000
Waltham grade-crossing elimination project	$33,000,000
Replace signal system from Ayer to South Acton	$19,800,000
Double track	$10,037,500
Commuter Rail Flyover Freight at Willows	$16,500,000
Replace Route 62 underground bridge in Concord	$6,600,000
Replace signal system from Fitchburg to Ayer (Willows)	$17,600,000
Track & ROW upgrades (speed improvements)	$11,000,000
Complete Fitchburg master drain program	$11,000,000
Station consolidation (Combine Ayer & Shirley into new Devens Station)	$11,000,000
Station consolidation (Combine Kendal Green/Hastings/Silver Hill)	$11,000,000
Grade separation - Great Road	$5,500,000
Grade separation - Parker Street	$5,500,000
Grade crossing improvements (South Street, Conant Road, Viles Street, Church Street, Main Street)	$2,750,000
Station consolidation (Combine Belmont/Waverly Stations)	$11,000,000
High-level platforms (Porter Square, Belmont, Waverly, Brandeis/Roberts, Lincoln, Concord, West Concord, S. Acton)	$22,000,000
Sub-total	***$238,887,500***
Additional trains - 3 engines & 18 double-decker cars	$50,400,000
Regional Station at I-495 (relocate Littleton)	$11,000,000
Sub-total (Related Improvements)	*$61,400,000*
TOTAL	*$300,287,500*

As shown, the cost to design and construct the travel time improvements is estimated at approximately $239 million. Once the track improvements are completed, the plan recommends purchasing three additional train sets to accommodate the increased ridership demands and possibly for scheduling additional service on the line. The new equipment will cost in the range of $50 million.

Finally, locating a regional parking facility at I-495, potentially through relocation of the existing Littleton Station, could add approximately 800 parking spaces to the line at a cost of approximately $11 million.

RECOMMENDED PLAN

Travel Time Improvements

The Fitchburg Commuter Rail Improvement Implementation Plan is attached as a map which summarizes the improvement actions, the preliminary costs to design and construct these improvements and the effect on ridership. Overall, the plan will improve travel times between Fitchburg and Porter Square to one hour. This represents a reduction in trip times of approximately 20 minutes.

To achieve these travel time improvements, a full range of track and signal upgrades are called for, including replacement of the entire existing signal system with an in-cab system, making track and right-of-way upgrades to improve the alignment and increase speeds to 80 mph wherever possible, and constructing high-level platforms at all stations. The increased operating speeds will save commuters approximately 8-plus minutes of time. Although the construction of high-level platforms is not specifically accounted for in the 8-plus minute travel time savings, high-level platforms will contribute to reduced dwell times at the stations. The plan also recommends improvements to several grade crossings and a commuter rail flyover at the freight yard in Ayer to minimize the impact of local traffic on the commuter rail service, thus increasing operating speeds.

To reach the one hour goal, the plan also calls for consolidation of stations at three locations. Consolidation of the Shirley and Ayer stations into a single station, along with consolidation of Kendal Green, Hastings and Silver Hill into a single station, and the consolidation of the Beverly and Waverly stations will save commuters 12 plus minutes of time. The construction of high-level platforms at the newly consolidated stations would also further enhance the travel time savings by reducing the associated dwell times.

Ridership and Cost

Estimates of the impact of a 20-minute reduction in travel times between Fitchburg and Porter Square in Cambridge indicate that daily boardings would increase by 3,200 – an almost 40% increase above existing ridership levels.

The cost to design and construct the travel time improvements is estimated at approximately $239 million. Once the track improvements are completed the plan recommends related improvements including equipment purchases and constructing regional parking at relocated Littleton Station for approximately $61 million. The total cost of full implementation of the Fitchburg Commuter Rail Line Improvement Implementation Plan is approximately $300 million.

APPENDIX A

Detailed Improvements by Mile Post

Mile Post	Task
1.00	Complete Fitchburg master drain program
1.32	Raise and realign mainline
2.00	Drainage work
3.40	Porter Square high-level platforms
3.50	Subgrade stabilization
4.30	Retire West Cambridge interlocking
5.70	Relocate/Expand Hill Crossing
6.40	Belmont Station high-level platforms (relocate east)
7.20	Construct retaining walls/slope stabilization
7.40	Waverly high-level platforms
--	Combine Belmont/Waverly Stations – add parking
8.50	Retire Clematis Brook interlocking
9.17	Start boat section
9.45	Retire Beaver Brook interlocking
9.50	Begin double track through Waltham
9.80	Eliminate Elm Street grade crossing
9.81	Waltham high-level platforms
9.90	Eliminate Moody Street grade crossing
9.95	Retire Waltham interlocking
10.49	End retaining wall & boat section
10.49	Replace Prospect Street undergrade bridge
10.50-10.90	Retaining walls/slope stabilization
11.45	Brandeis/Roberts high-level platforms
11.50	South Street grade separation
12.00	Install new interlocking
12.16	Replace undergrade bridge
12.40	Construct regional station (close Kendal Green/Hastings/Silver Hill)
12.80	Remove bridge
13.20	Remove stations/platforms
13.20	Church Street grade separation
13.70	Remove stations/platforms
13.70	Possible grade separation (Viles Street)
13.70-13.80	Remove Hastings crossovers
14.30	Potential grade separation (Conant Road)
14.70	Remove stations/platforms
14.73	Replace bridge (Merriam Street)
15.60	Eliminate grade crossing
15.90	Eliminate grade crossing
16.00	Eliminate grade crossing
16.30-16.70	Drainage improvements
16.70	Lincoln high-level platforms

	Mile Post	Task
OPTION 1A	16.70-17.80	New interlocking
	16.70-17.80	Install new track
OPTION 1B	16.70-17.80	Realign track 1
	16.70	Potential grade separation/Improve at-grade crossing
	17.12	Replace overhead bridge
	20.10	Concord high-level platforms
	19.50	Explore relocation of Concord Station
	20.61	Rebuild bridge
	20.80	Construct Concord interlocking
	21.60	Close grade crossing (Baker Avenue)
	22.00	West Concord high-level platforms
	22.50	Potential grade separation
	24.10	Potential grade separation
	24.90	Retire South Acton interlocking
	24.90-33.70	Install double track
	25.00-33.70	Replace grade crossings
	25.40	South Acton high-level platforms
	25.60	Retire Martin Street interlocking
	26.30	New interlocking
	26.80-26.90	Potential grade separation
	30.20	Littleton high-level platforms
OPTION 2A	33.72	Commuter Rail Flyover Freight at Willows
OPTION 2B	33.70	Completely reconfigure Willows
	33.70-36.00	Add third track
	35.80	Reconfigure CPF-AY
OPTION 3A	38.00	New Devens Station (Combine Ayer & Shirley)
OPTION 3B	36.10	Ayer high-level platforms
	39.00	Shirley high-level platforms
OPTION 4A	36.25	New interlocking
	37.20	New interlocking
OPTION 4B	36.50	New interlocking
	36.50	Retire freight track
	36.50	Relocate freight facility to WN&P
	39.50	Close grade crossing (Main Street)
	40.17	Retire CPF-Slab City interlocking
	41.80-43.50	Realign track
	41.80	New interlocking
	43.33-43.50	Construct retaining wall & drainage

Railroad Operations
Detailed Fitchburg Branch Improvements by Mile Post

Mile Post	Task
45.20	North Leominster high-level platforms
45.20	Build access from vacant parcel
46.60	New interlocking
47.50	Upgrade or relocate Fitchburg layover facility
48.10	Reconfigure or replace CPF-FG
48.60	Construct retaining wall & drainage
49.50	Connect Fitchburg Station track to mainline 1
49.50	New interlocking
49.50	Fitchburg high-level platforms on station and number 2 track